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This report of one phase of a study concerned with seeking means of extending the success of dental officers through delegation of certain treatment procedures to auxiliary personnel focuses upon determining the amount of training dental assistants (termed dental technicians by the Navy) require in order to perform the treatment procedure involved. Twelve dental assistants who had had no special training beyond the Navy's 16-week Dental Technician Training Course and whose dental assisting experience ranged from less than 3 months to 23 months were trained in a 7-week course to perform several specific treatment procedures. Evaluators examined 21 restorations which had been inserted by trainees and 41 which had been done by conventional methods. Only one restoration inserted by a trainee was considered unsatisfactory and all restorations inserted by conventional methods were scored satisfactory. It was concluded that the assistants' special training had been sufficient to justify proceeding to the next phase of the study which involved clinical tests of the restorations, which are reported in a related document (VT 007 733). (JK)

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GREATER UTILIZATION OF DENTAL TECHNICIANS

I. Report of Training

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Dental Research Facility
Navy Training Center
Great Lakes, Illinois

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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GREATER UTILIZATION OF DENTAL TECHNICIANS

I. Report of Training

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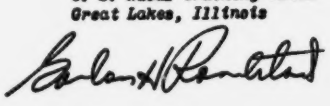

INTRODUCTION

In 1959, one of the authors of this report (WEL) conducted a small scale exploratory study on expanded duties for dental technicians*. In this study, two dental technicians were trained to accomplish selected operative procedures. The technicians were taught to insert restorative materials after the cavity preparations had been prepared in the teeth by the dentist. With this type of assistance it was possible to provide more dental treatment for more patients. The study was continued until 12 treatment periods had been completed. Each treatment period was approximately three and one-half hours. When the results of treatment periods 11 and 12 were compared to 1 and 2, a threefold increase in the number of treatment procedures was observed.

Further impetus was given to the dental technician study of the Department of the Navy when the Commission on the Survey of Dentistry in the United States recommended that "the dental profession conduct studies designed to develop and expand the duties of auxiliary personnel."[1] In 1960, the recommendation of the Commission became the policy of the American Dental Association with the adoption of the following resolutions by the House of Delegates:

> "Resolved, that the Council on Dental Education be requested to urge accredited dental schools including the training activities of the federal dental services to undertake carefully designed programs of experimentation and research in the training of dental hygienists and dental assistants so that the profession may determine more precisely their individual roles as members of the dental health team and thus enlarge the dental profession's capacity for service to the people of this country.
>
> Resolved, that in any research and experimental programs in the training of dental hygienists and dental assistants authorized by (the above resolution), the Council on Dental Education be directed to review the programs with a view to their ultimate evaluation and to urge accredited dental schools in developing these programs to consult with the constituent dental society and the state board of dental examiners in order to insure that the research and experimental programs are consistent with the policies of the profession in the area."[2]

Shortly thereafter, the Council on Dental Education adopted the following resolution as general policy for experimentation:

> "Resolved, that in advising and counselling dental schools and

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* The Navy uses the term "dental technicians" for dental assistants.

federal training agencies in the design of experimental studies to expand the functions of the dental hygienist and dental assistant, the auxiliaries be permitted to perform those procedures and operations which assist the dentist in fulfilling his professional responsibilities as long as he retains direct supervision of the operations and while the auxiliary does not perform duties which require the full and complete knowledge of dentistry."[2]

In view of the encouraging preliminary results and the encouragement advanced by the Commission and the Association, the Bureau of Medicine and Surgery in 1962 authorized the Dental Research Facility at Great Lakes, Illinois to expand the duties of 12 technicians for a one year research study. The original study was to be repeated and enlarged so that some base line information could be obtained and submitted to the American Dental Association for evaluation and consideration.

Subsequently, the Council on Dental Education clarified its position on experimentation in training and utilization of dental assistants, defined those professional duties which must be retained by the dentist, and elaborated on the research and experimentation on additional duties which might be considered appropriate to assign to either a dental assistant or hygienist.[3] The present investigation is completely within those perimeters.

OBJECTIVES

1. To determine how much more operative dentistry a dental officer can accomplish by delegating certain treatment procedures to technicians.

2. To determine by short and long term evaluation, using double blind techniques, whether the quality of the treatment is comparable to that accomplished by conventional treatment methods.

3. To determine the amount of training the technicians will require before they are capable of performing the procedures.

4. To determine the mental and physical effects on the dental officers and technicians operating under this system.

This is the first of a series of reports which will be written and is concerned with training, objective three. The other objectives will be considered in subsequent reports.

PERSONNEL

Three dental officers were assigned to the Dental Research Facility, Dental Department, Administrative Command, U. S. Naval Training Center, Great Lakes, Illinois to train twelve dental technicians and to conduct the study.

Technicians to serve in this study were selected from among the dental technicians on duty at Great Lakes. Selection was limited to technicians who had no special training beyond the Navy's 16 week Dental Technician Training Course, who had no disciplinary record, who expressed personal interest in participating in this research study, and who were not due for transfer from this duty station prior to completion of the study. Under these criteria 16 technicians were found eligible. Twelve of these 16 were selected to serve as test technician subjects (five females and seven males).

One of the twelve had been assisting a dental officer for 23 months, another for 16 months, one for six months, and the other nine less than three months. All were high school graduates. Two had some college education, one 18 months and the other six months. Their mean age was 20 years with a range of 19 to 23.

After enlisting in the Navy, the females received ten weeks of recruit training at Bainbridge, Maryland. The males received nine weeks of recruit training at either San Diego, California or Great Lakes, Illinois

RECRUIT TRAINING

Recruit training is a basic course to effect in the recruits a smooth and successful transition from a civilian to a military way of life; to instill in the recruits a sense of pride, responsibility, and esprit de corps toward the Naval Organization of which they have chosen to become members; to inculcate in the recruits an understanding and appreciation of the fundamental workings of democracy and emphasize the role the Navy plays in national and international affairs; and to provide the recruits with the basic knowledge and skills which will enable them to operate effectively at locations to which they may be assigned upon completion of recruit training.

The curriculum for recruit training consists of academic, military and physical training. Although there are some differences in the curriculum for male and female recruits, they are generally instructed in the following subject matter: orientation to life in the navy, ships and aircraft, naval history and citizenship, discipline and customs,

fundamentals of first aid, personal and oral hygiene, job and training opportunities, physical fitness and personal appearance, water safety and survival, military drill and inspections, and character education.

DENTAL TECHNICIAN TRAINING

The Dental Technician, General School at San Diego prepares the student to perform the duties of a general dental technician, primarily as a chair side assistant.

The following qualifications are required for admission to the basic course for dental technicians. The applicant must have requested enrollment in the course, at least two years of obligated service at the time of entry into the course, and a combined general Classification Test and Arithmetic Score of 100. The combined GCT and ARI score may be reduced ten per cent for highly motivated applicants.

The GCT score measures ability to learn and think, as demonstrated in understanding of relationships between words and ideas. This is not an "IQ" test. It is principally a measure of an individual's ability in the area of verbal reasoning. The ARI test measures ability to use numbers in practical problems and to reason in arithmetical terms. A combined score of 100 indicates average to above average ability in these two factors.[4,5]

There are three ways personnel may request dental technician training. First, they may request the training at the time of enlistment. Second, those who do not indicate any preference for technical training at the time of enlistment are given classification tests during recruit training and are advised not only regarding their basic skills and inherent potentialities but also the types of naval training suitable to their capabilities and available to them. Then they are asked to list three choices, but the assignment to one of three is based on the needs of the naval service. Third, they may ask to be assigned to a dental department after graduating from recruit training and later request dental technician training.

Two of the twelve technicians selected for the research study asked for dental technician training at the time of enlistment, four during recruit training, and six worked in a dental office before requesting training.

It should be mentioned at this point that several alternative levels of training were considered as prerequisite to selection of trainee subjects for this research. Naval dental technicians are provided a continuing training program. After completing the Dental Technician,

General School, the technician obtains a period of clinical experience, during which he receives continuing formal in-service training principally in the form of weekly one hour lectures. Upon advancement to Dental Technician, Second Class, the Dental Technician, General becomes eligible for the Dental Technician, Advanced General School. For reasons of man power economy, and in part to test the adequacy of the basic course, the present study was limited to subjects who had attended only the Dental Technician, General School and who had had a minimum of in-service training. This basic 16 week course, including lecture, laboratory and clinic hours as illustrated in Table (1), is summarized in the following thirteen subject outline:

1. Operating Room Assistance
   a. Training in instrument nomenclature, identification of dental operative and surgical instruments, and cabinet arrangement.
   b. Instruction in the preparation of dental spaces and care and sterilization of equipment and instruments required for operative or surgical procedures.
   c. Assisting dental officers in dental department clinics.

2. Roentgenology
Instruction in the specific techniques necessary to expose, process, mount and file intraoral and extraoral x-ray films.

3. Dental anatomy and histology
The study of the components and supporting structures of the human teeth, with emphasis on identification of tooth surfaces.

4. Dental charting
The study of the meanings of dental abbreviations, markings and symbols used on forms at naval dental activities.

5. Manipulation of dental materials
Training in the preparation of dental materials for restoring lost tooth structure.

6. Dental materia media, therapeutics and toxicology
The study of the properties and fundamental uses of the drugs commonly used in dentistry; glossary of terms used in materia medias and therapeutics.

7. Oral hygiene
Training in techniques of oral prophylaxis and methods of instructing patients in proper oral hygiene.

8. Emergency procedures, oral pathology and bacteriology
Training in recognition and emergency treatment of painful conditions due to diseased structures and tissues of the mouth, studying the role of bacteria in normal and diseased tissues, and correlation of dental histology with dental pathology.

9. Casualty treatment
Training in the fundamentals of first aid treatment for the injured.

10. Anatomy and physiology
Study of the anatomy of the human body and functions of its organs.

11. Typing
Training to a degree of proficiency necessary to meet the requirements of advancement in rate.

12. Property, accounting and clerical procedures
Training in procedures for the requisition, disposition and custody of supplies and equipment in the dental operating room. The study of dental department forms, reports and official correspondence.

13. Office management
Training in practical dental department procedures and the techniques of maintenance of dental spaces.

TRAINING FOR RESEARCH STUDY

A curriculum was designed to train the 12 technicians to accomplish the following procedures:

1. Placement of a rubber dam.
2. Placement of cavity liner and base materials.
3. Placement of matrices.
4. Silver amalgam placement and condensation utilizing hand instruments.
5. Carving amalgam restorations to preliminary contour and occlusion.
6. Placement of cement silicate restorations.
7. Placement of temporary restorative materials.
8. Finishing and polishing restorations.

The curriculum consisted of 150 hours of lecture, laboratory and clinical training and was given in five weeks. A description of the subjects taught is given below and number of hours allotted to each subject is given in Table 2.

1. Dental Anatomy

A continuation of basic training covering the anatomy of human teeth and their supporting tissues. The laboratory time was concerned with contouring wax restorations in extracted human teeth.

2. Operative Dentistry

a. Lectures and demonstrations in applying rubber dam, inserting liners or bases, placing matrix bands for amalgam or silicate restorations, inserting the filling materials, contouring and adjusting the occlusion of the restorations, and polishing the restorations, first in extracted teeth and later in typodonts.

b. Clinical training in the care and use of instruments, asepsis and sterilization, exclusion of saliva, patient management, and clinical experience in placing amalgam and silicate restorations. Early technician-patient contact and immediate clinical application of learned technical procedures was emphasized.

3. Dental Materials

A continuation of the basic course covering the more advanced phases of manipulating and inserting filling materials in prepared teeth.

4. Oral Hygiene

A continuation of the basic course with additional clinical experience.

The lecture and laboratory phases were completed by the end of the third week. The clinical phase of the Oral Hygiene Course had also been completed by then.

Before the clinical phase of training commenced, three treatment teams were formed. Each team consisted of one dental officer and four technicians. Four females were assigned to one team, four males to the second, and the third team had one female and three males. Then each treatment team was allotted three dental chairs and units in a non-partitioned nine chair clinic which was approximately 1150 square feet.

After patients were seated in the nine chairs, each dental officer examined the patients assigned to his three chairs and outlined a treatment plan for the operative dentistry to be accomplished during the appointment. The dental officers limited their services to diagnosis, administering local anesthetics, and cutting and severance of the hard and soft tissues involved in the treatment of carious teeth. After the cavity preparations had been completed by the dental officers, the technician assigned to the chair placed a cavity liner or base, if directed, and then either an amalgam or silicate restoration under the supervision of the dental officer. This permitted the dental officer to move to another one of his three chairs and commence treatment for another patient. When the cavity preparations had been completed for the second patient, he moved to the third chair.

Since each team had four technicians but was only allotted three chairs in the clinic, only three of the four technicians could be assigned to a chair. The fourth technician served as a roving assistant to the other three. This technician's duties were to mix and pass the restorative materials for the technician who was inserting the filling and to assist in any other way possible. Each technician served as the roving assistant every fourth day.

In the fourth week of training, the technicians had their first opportunity to insert restorations in patients. The dental officers selected teeth which required simple type restorations, prepared the cavities, and supervised every phase of the insertion of the restoration. The average number of restorations inserted during this week by each technician was eleven. As the technicians progressed and became more efficient, they were given more complicated restorations and greater numbers of them. They averaged seventeen restorations for the fifth week of training.

While this completed the planned curriculum, it was decided to extend the clinical training to allow the teams to acquire more experience and become better acquainted with this system of treatment before starting other clinical tests. During the first extra week of training, the technicians averaged 24 restorations; and the week following they averaged 25. Since the teams had become more efficient, an evaluation of training was made at this time.

EVALUATION OF RESEARCH TRAINING

In order to assess the quality of the restorations placed by the treatment teams, three dental officers not associated with the research

study were asked to evaluate a random sample of the restorations and those of a control group. The patients in the control group had been treated by conventional methods by another group of seven dental officers.

The system employed during treatment was unknown to the evaluators and they were asked to score the restorations as satisfactory or unsatisfactory and invited to make comments concerning the quality of the restorations.

The evaluators examined 21 restorations which had been inserted in 12 patients by the research teams and 41 restorations which had been inserted by conventional methods in 13 patients. The percentage of silicates, one surface amalgams, and two or more surface amalgams was approximately the same for both groups of patients. After the evaluations had been completed independently by the evaluators, the results were tabulated. A restoration was not scored as satisfactory or unsatisfactory unless two out of the three evaluators concurred.

In the group treated by the research teams there were two restorations which were given a final score of unsatisfactory. One silicate restoration had become loose and the cavity design of another had attracted the attention of two of the evaluators. Since the cavity design is beyond the control of the technicians, only one restoration was considered to be unsatisfactory.

All restorations inserted by conventional methods in the control group had a final score of satisfactory.

Although the number of technician restorations that were graded for quality was small, the results of this evaluation indicated that the technicians' special training had been sufficient to justify going on to phase (2) of this study - three 12-week clinical tests.

SUMMARY AND CONCLUSIONS

Twelve naval dental technicians, who had successfully completed a 16 week basic dental technician training course, were given seven additional weeks of special training.

During this 7 week period they were taught to insert satisfactory silicate or amalgam restorations in teeth which had been prepared by dental officers.

Three 12 week clinical tests are now in progress and will be the subject of separate reports.

LIST OF REFERENCES

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5. Noel, J. V., The Bluejacket's Manual. Annapolis, Maryland, The United States Naval Institute, 1960, 16th Ed., Chapter 11.

6. Department of the Navy. Catalog of Dental Technician Schools and Courses, NAVMED P-5029. Washington, D. C., Dental Division, Bureau of Medicine and Surgery, 1961.

TABLE 1

Curriculum for Dental technician training
(16 weeks)

Subject	Hours			
	Lecture	Laboratory	Clinic	Total
1. Operating room assistance				
a. Instrument nomenclature and cabinet arrangement	22			22
b. Preparation of spaces, equipment, operative and surgical setups		38		38
c. Assisting dental officers in dental department clinics			144	144
2. Roentgenology	12	20	14	46
3. Dental Anatomy and histology	11			11
4. Dental charting		31		31
5. Manipulation of dental materials	1	38		39
6. Dental materia medica, therapeutics, and toxicology	9			9
7. Oral hygiene	8	16	14	38
8. Emergency procedures, oral pathology and bacteriology	19			19
9. Casualty treatment	16	16		32
10. Anatomy and physiology	20			20
11. Typing	2	41		43
12. Property, accounting and clerical procedures	15	9		24
13. Office management	6		78	84
Total Hours	141	209	250	600

TABLE 2

Curriculum for expanding the duties of dental technicians
(5 weeks)

Subject	Hours			
	Lecture	Laboratory	Clinic	Total
1. Dental Anatomy	2	12		14
2. Operative Dentistry	18	40	60	118
3. Dental Materials	2	4		6
4. Oral Hygiene	2		10	12
Total Hours	24	56	70	150